The definitive 3D Printing glossary

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A comprehensive glossary covering terms related to 3D Printing

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3D model	A 3D design typically produced on a CAD program.
3D modelling	The act of using 3D CAD programs to produce a design.
3D printer	An additive manufacturing machine that constructs a solid shape by building one layer at a time.
3D printing	The act of using an additive manufacturing machine (3D printer) to produce a solid object one layer at a time (also known as additive manufacturing).
3D scan	A process that captures the geometry of a real-world object and uses that data to produce a 3D model.

A

ABS	Acrylonitrile butadiene styrene (ABS) is a thermoplastic polymer commonly used in FDM 3D printing.
Acetone treatment	A post processing treatment often applied to 3D printed ABS parts to smooth the surface.
Additive manufacturing	The process of fabricating a part by adding material in layers (also known as 3D printing).
Amorphous	Any noncrystalline solid in which the atoms and molecules are not organized in a definite lattice pattern. Glass and polymers are typical amorphous solids. The opposite to crystalline.
Anisotropic	A material that has varying physical properties when measured in different directions. Wood and composites are common examples of anisotropic materials. The opposite to isotropic.

B

Binder jetting	Binder Jetting uses thin layers of powder to build up a 3D model. A colored binding agent extruded from a nozzle binding the powder together, solidifying the object with the desired colored surface. After the printing process, the models are strengthened with superglue and UV coated to prevent de-coloration by sunlight.
Brim	A single flat layer printed around the base of a model to prevent warping. The width of the brim can typically be altered in a slicer program.
Bridge	Occurs when the printer is required to print between 2 supports or anchor points. Because there is no support offered for the initial layer being printed (there is nothing to build upon) and it is required to "bridge" a gap.
Brittleness	A property of materials where it breaks without significant deformation. Chalk and ceramics are examples of brittle materials.
Build plate	The area where a 3D print is printed upon.
Build resolution	Typically refers to the layer height that a 3D print is printed at. Similar to the resolution on a television or computer monitor but in 3D the lower the build layer height the higher the part resolution.
Build time	The total time it takes for a 3D printer to complete a 3D print.

C

CAD	Computer aided design - a method of design where a computer program is used to create 3D objects in the form of electronic files.
Casting	The process of pouring a liquid material (typically metal) into a hollow cavity to produce a solid part of a specific shape.
CNC machining	Computer numerically controlled machining - a subtractive method of manufacturing that involves a computerized machine removing material over a predetermined path to produce a final part.
Creep	The tendency for materials to move or deform over time when subjected to a continuous load. Resins and polymers often experience this phenomena.
Crystalline	Any solid in which the atoms and molecules are organized in a lattice pattern. Metals are crystalline solids. The opposite to amorphous.
Cupping	Occurs in the SLA process when a hollow section of a print sucks up resin during the peel process (similar to a an upside down empty cup entering water). This suction effect can cause a part with this walls to fracture.
Curing	Hardening of resin or photopolymers used for 3D printing typically done with a UV light.

D

Ductility	A material is said to be ductile if it is able to be deformed without losing toughness. Wire is an example of a ductile material. The opposite to brittle.

E

Elongation	Pulling or stretching a material. An important term in plastics to understand how a material will deform under load.
End part	A component that is intended to be used directly in a functional capacity.

F

Flexural strength	The stress (in MPa) at failure in bending.
Filament	The general term given to the material used in FDM. Typically supplied in coils or rolls the filament is heated up and fed through the nozzle to deposit the material on the build plate.
FDM	Fused Deposition Modelling (FDM) was a string of solid material (filament), pushing it through a heated nozzle and melting it in the process. The printer continuously moves this nozzle around from the die and the process is repeated again. A precise location, where it instantly cools down and solidifies. This builds up the model layer by layer. The most common 3D printing technology.

G

Glass transition temperature	The temperature region where a material transitions from a hard, glassy material to a soft, rubbery material.
G-code	The common name for the most widely used numerical control (NC) programming language. It is used in computer-aided manufacturing to control automated machine tools (like CNCs and 3D printers).

H

Hollow	A 3D print that is not solid and also does not contain any infill. Hollow models are much faster and cheaper to print but have very low strength.

I

Infill	A value usually represented in percentage that shows how much a solid model should be filled in with material when printed. 100% infill means the part is completely solid. Infill is used to make 3D printing cheaper and faster.
Islands	Occur in SLA printing and refer to cross sectional areas of a model that are not connected.
Injection molding	The process of injecting plastic in a melted liquid form into a die. The plastic fills the empty cavities of the die and cools until it has solidified. The solid plastic part is then ejected from the die and the process is repeated again.
Isotropic	A material that has the same physical properties in all directions. Glass and metal are common examples of isotropic materials. The opposite to anisotropic.

J

Jig	A frame used to hold components or parts in a fixed position used in the assembly or manufacturing process.

K

L

Layer height	Sometimes called print resolution this is the height of each layer of a 3D print typically measured in microns.

M

Melting point	The temperature a solid melts or turns into a liquid.
Metal printing	The process of 3D printing in metal. Objects are created from thin layers of powdered material by selectively sintering or melting it using a high power laser. There are a large range of metal printing technologies.
Metal powder	The material used for metal printing.
Micron	A measurement of distance regularly used to describe 3D printing layer height. 1000th of a millimeter. A human hair is approximately 17 microns thick.

N

Nozzle	The part of a 3D printer where the build material is extruded from.
Nozzle diameter	The diameter of the material that is extruded out of the nozzle. This plays an important role in FDM where shells and walls should be a multiple of nozzle diameter.
Nylon powder	A common build material used in the SLS printing process.

O

OBJ file	A geometry definition file. CAD models are exported as OBJ files then imported into a slicer program. The slicer program then converts the file into G-code to be interpreted by the 3D printer. Similar to .STL files.
Offset	In 3D printing offset refers to layers that are not printed directly inline with one another and are instead shifted to the side. This is often a printer calibration issue and will impact the quality of a print.
Overhang	Overhangs occur when a newly printed layer of material is only partially supported by the layer below. Angled walls are considered overhangs and depending on the print technology and angle often require support to print successfully.

P

PLA	Polylactic acid (PLA) is a thermoplastic polymer commonly used in FDM 3D printing. It is derived from corn starch or sugar cane.
Photopolymer	A polymer that changes its properties when exposed to light. For 3D printing this generally refers to photopolymers that are in a liquid/resin state and become solid when exposed to UV light.
Polyjet	Similar to inkjet printing, but instead of jetting drops of ink onto paper, jets droplets of liquid photopolymer (in layers) onto a build tray and cures them instantly using UV light. The results are fully cured objects that can be handled and used immediately.
Polymer	A material whose molecular structure is composed of multiple repeating units. Natural polymeric materials include amber, wool, silk and natural rubber while synthetic polymers include resin, nylon, polystyrene and silicon.
Post processing	Any act of improving the appearance or material properties of a 3d print after it has been printed. This covers a large range of processes in 3D printing that vary by technology (support removal, UV curing, heat treating, sanding, bathing, polishing, painting etc).
Print head	The part of a 3D printer where material is extruded/jetted from. Is an assembly of multiple components including the nozzle in the case of FDM.
Print speed	The speed the print head moves around the build plate typically measured in mm/s. 50mm/s is a common speed for desktop FDM printing.
Print volume	The largest possible dimensions a 3D printer is able to print at. Varies significantly by technology.
Prototype	An early part or model of a design built before production to test form, function, aesthetics and interaction usually at a low cost. Prototypes are typically items to learn from to improve a design.

Q

R

Raft	A thick grid with a roof that is added to the base of the part to limit the likelihood of warping occurring. Different to a skirt or brim.
Rapid prototyping	The process of creating physical prototypes directly from digital data.
Resin	A solid or highly viscous substance which is typically converted into a polymer. SLA uses resin exposed to UV light (a laser) to build a part layer by layer.

S

Shell	In FDM printing the shell refers to the walls of the print that are exposed to the outside of the model. FDM will print shells at the perimeter of the model and then fill the model with infill. Different to wall thickness.
Sintering	The process of fusing particles together to form a solid mass of material using heat or pressure without melting it.
Skirt	A line that is initially printed around the print (but not connected to the print) to clean the nozzle head.
SLA	Stereolithography (SLA) creates 3D prints out of a liquid (photopolymer) resin, solidifying the material layer by layer using a laser.
SLS	Selective Laser Sintering (SLS) uses a laser to shape and form extremely thin layers of powdered material by melting or sintering it together one layer at a time to create a solid structure.
STL file	A geometry definition file that uses triangles to describe the surfaces of a 3D model. CAD models are exported as STL files then imported into a slicer program. The slicer program then converts the file into G-code to be interpreted by the 3D printer.
Strain	Measure of the deformation of the material relative to its original shape measured in mm/mm (or a dimensionless ratio).
Stress	The internal forces that particles of a material exert on each other measured in Pascals.
Subtractive manufacturing	Any manufacturing process that removes material to form a final shape (milling, turning etc). The opposite to additive manufacturing (3D printing).
Support	Support is the extra material that is printed during a 3D print allowing a design with complex geometry to be successfully printed. Support is required to successfully print overhangs and bridges and is removed and discarded in the post processing stage.
Surface finish	In 3D printing this refers to the roughness of the surface of a 3D printed part. Generally qualitative.

T

Tank (resin)	The area where resin sits before being cured in the SLA process.
Temperature differential	The difference in temperature between 2 points. In 3D printing reducing the temperature differential between 2 nearby points reduces the likelihood of warping or deformation.
Tensile strength (ultimate)	The stress (usually in MPa) at which a material will fracture or break when subjected to a tensile load.
Tensile strength (yield)	The stress (usually in MPa) at which a material will shift from elastic deformation (returning to its original shape) to plastic deformation (permanent deformation) when subjected to a tensile load.
Thermoplastic	A plastic material that becomes pliable or moldable above a specific temperature and solidifies upon cooling.

U

UV light	For 3D printing this refers to the type of light that is used to cure (harden) photopolymers in SLA and Polyjet 3D printing.

V

W

Wall thickness	Generally associated with minimum wall thickness - the thinnest dimension a wall can be printed at such that it can support the model. Varies by technology. Different from shell thickness.
Warping	Due to the high heat involved in most 3D printing process differential cooling results in areas of a print cooling at different rates resulting in deformation.

X

X-axis	The side to side (left and right) direction relative to the print bed

Y

Y-axis	The back to forth direction relative to the print bed.

Z

Z-axis	The up and down direction relative to the print bed.

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